Course Curriculum of First Semester
as per the ICAR-Sixth Deans' Committee Report for the Academic Programmes in
AGRI-BUSINESS MANAGEMENT

- UG-Certificate in Agri-Business Management
- UG-Diploma in Agri-Business Management
- UG-Degree: B.Sc. (Hons.) Agri-Business Management

Mahatma Phule Krishi Vidyapeeth, Rahuri

Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola

Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani

Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli

Maharashtra Agricultural Universities Examination Board, Pune

Compiled & Submitted by

Dr. V.A. Shinde
Professor & Ex-Head (Ag. Econ.), MPKV, Rahuri.
UG Degree Syllabus State Coordinator
with
UG Degree Syllabus Discipline Coordinators &
DICC - UG Degree Syllabus Core Committee

Submitted to the

Directors of Instruction Coordination Committee

~ w.e.f. AY, 2024-25 ~

Course Curriculum of First Semester as per the
ICAR-Sixth Deans' Committee Report for Academic Programmes in
AGRI-BUSINESS MANAGEMENT

B.Sc. (Hons.) Agri-Business Management

Semester: I (New) ***w.e.f.*** **Academic Year: 2024-25**

Sr. No.	Course No.	Course Title	Credit Hrs.	Remark
1.	**CAC-111**	*Deeksharambh* (Induction-cum-Foundation Course)	2(0+2)	NG (2 Weeks)
2.	**AEC-111**	National Service Scheme (NSS-I) / National Cadet Corps (NCC-I)	1(0+1)	
3.	**AEC-112**	Communication Skills	2(1+1)	
4.	**MDC-111**	Farming-based Livelihood Systems	3(2+1)	
5.	**MATH-111*/ BOT-111****	Basic Mathematics*/ Basic Botany**	2(2+0)	Need-based
6.	**ABM-111**	Introduction to Agribusiness Management	2(2+0)	
7.	**ECON-111**	Fundamentals of Agricultural Economics	2(2+0)	
8.	**AGRO-111**	Introduction to Agronomy and Crop Production Technology	2(1+1)	
9.	**GPB-111**	Introduction to Genetics and Plant Breeding	2(1+1)	
10.	**PATH-111**	Management of Plant Diseases	2(1+1)	
11.	**SEC-111**	Skill Enhancement Course-I *(To be offered from the bouquet of SEC Courses)*	2(0+2)	
12.	**SEC-112**	Skill Enhancement Course-II *(To be offered from the bouquet of SEC Courses)*	2(0+2)	
		Total Credits Hrs.	**22(12+10) G 2(0+2) NG**	

CAC: Common Academic Course, **AEC**: Ability Enhancement Course,
MDC: Multidisciplinary Course, **SEC**: Skill Enhancement Course,
G: Gradial, **NG**: Non-Gradial

Note: *MATH-111 for **PCB** student/ **BOT-111 for **PCM** student / **PCMB** students should opt any one choice-based course viz., MATH-111 or BOT-111 for completion of the mandatory gradial credits.

B.Sc. (Hons.) A.B.M. : First Semester

Course-wise Syllabus with Teaching Schedules

Semester	**:**	**I**	
Course No.	**:**	**CAC-111**	**Credit Hrs. : 2 (0+2) NG/ 2 Weeks**
Course Title	**:**	***Deeksharambh* (Induction-cum-Foundation Course)**	
Non-Gradial Common Academic Course for the said UG degree with the activities to be conducted during initial two weeks.			

Objectives:

(i) To create a platform for students to help for cultural Integration of students from different backgrounds,

(ii) To know about the operational framework of academic process in university, instilling life and social skills,

(iii) To create Social awareness, Ethics and Values, Team work, Leadership, Creativity,

(iv) To identify the traditional values and indigenous cultures along with diverse potentialities both in indigenous and developed scenario.

ACTIVITIES

- Introduction/ Orientation and Discussions on operational framework of academic process in University/ College, as well as interactions with Academic and Research Managers of the University.
- Interaction with Alumni, Business Leaders, Perspective Employers, Outstanding Achievers in related fields and people with inspiring life experiences.
- Group activities to identify the strength and weakness of students and to learn from each other's life experiences.
- Activities to enhance Cultural Integration of students from different backgrounds.
- Field visits to the relevant fields/ establishments.
- Sessions on Personality Development (Instilling Life and Social skills, Social awareness, Ethics and Values, Team work, Leadership etc.) and imbibing the Communication skills.

Note: *The details of the relevant activities will be decided by the parent University in line with the above-mentioned broad activities.*

Semester	**:**	**I**	
Course No.	**:**	**AEC-111**	**Credit Hrs. : 1 (0+1)**
Course Title	**:**	**National Service Scheme (NSS-I) / National Cadet Corps (NCC-I)**	
Gradial Common Course across all UG Degrees			

Course No.: AEC-111	**Course Title: National Service Scheme-I (NSS-I)**	**Credit Hrs: 1(0+1)**

SYLLABUS

PRACTICAL

Introduction and Basic Components of NSS

- Orientation: History, Objectives, Principles, Symbol, Badge; Regular Programs under NSS.
- Organizational structure of NSS, Code of conduct for NSS volunteers, Points to be considered by NSS Volunteers' awareness about Health.
- NSS program activities. Concept of regular activities, Special camping, Day camps, Basis of adoption of village/slums, Conducting survey, Analysing Guiding financial patterns of scheme, Youth program/schemes of GOI, Coordination with different agencies and maintenance of diary. Understanding youth. Definition, Profile, Categories, Issues and Challenges of youth; and Opportunities for youth who is agent of the social change.
- Community mobilization. Mapping of community stakeholders, Designing the message as per problems and their culture; Identifying methods of mobilization involving youth-adult partnership. Social harmony and National integration.
- Indian history and culture, role of youth in nation building, Conflict resolution and peace building. Volunteerism and Shramdaan. Indian tradition of volunteerism, its need, importance, motivation and constraints; Shaman as part of volunteerism.
- Citizenship, Constitution, and Human rights. Basic features of constitution of India, Fundamental rights and duties, Human rights, Consumer awareness and rights and Right to information. Family and Society. Concept of family, Community (PRIs and other community-based organizations) and Society.

TEACHING SCHEDULE

PRACTICAL

Exercise No.	Exercise Topic/ Title	Weightage (%)
1	Orientation, History, Objectives, Principles, Symbols, Badge	10
2	Regular Programmes under NSS	10
3	Organizational Structure of NSS	10
4	Code of Conduct of NSS Volunteer	10
5	Points to be considered about NSS Volunteers awareness about Health	5
6	NSS Programme Activities- Concept of Regular activities	5
7	NSS Programme Activities- Special Campaign	5
8	NSS Programme Activities- Day Camps	5
9	NSS Programme Activities- Adoption of village, Conducting survey, Analyzing Guiding financial patterns of scheme	5
10	NSS Programme Activities- Youth programs/schemes of GOI, Coordination with different agencies and maintenance of diary. Understanding youth. Definition, Profile, Categories, Issues and Challenges of youth and Opportunities for youth who is agent of the social change.	5
11	Community Mobilization- Mapping of community stakeholders, Designing the message as per problems and their culture; Identifying methods of mobilization involving youth-adult partnership.	5
12	Community Mobilization-Culture, Social harmony and National integration.	5
13	Indian History and Culture- Role of youth in Nation Building	5
14	Volunteerism and Shramdaan: Indian tradition of volunteerism, its need, importance, motivation and constraints; Shaman as part of volunteerism.	5
15	Citizenship, Constitution and Human Rights: Basic features of constitution of India, Fundamental rights and duties, Human rights, Consumer awareness and rights and Right to information.	5
16	Family and Society: Concept of family, Community (PRIs and other community-based organizations) and Society.	5
	Total =	**100**

Course No.: AEC-111	Course Title: National Cadet Corps-I (NCC-I)	Credit Hrs.: 1(0+1)

SYLLABUS

Objective: To integrate and develop qualities of leadership, discipline, character and patriotism and foster the NCC Motto: **"Unity and Discipline"** among the youth.

PRACTICAL

- Aims, Objectives, Organization of NCC and NCC Song. DG's Cardinals of Discipline.
- Drill- aim, General words of command, Attention, Stands-at-ease, Stand-easy and Turning.
- Sizing, Numbering, Forming in three ranks, Open and Close order march and Dressing.
- Saluting at the halt, Getting on parade, Dismissing and Falling-out.
- Marching, Length of pace and time of marching in quick/slow time and halt. Side pace, Pace forward and to the rear. Turning on the march and wheeling. Saluting on the march.
- Marking time, Forward march and halt. Changing step, Formation of squad and squad drill.
- Command and control, Organization, Badges of rank, Honours and Awards.
- Nation Building- Cultural heritage, Religions, Traditions and Customs of India. National integration. Values and ethics, Perception, Communication, Motivation, Decision making, Discipline and duties of good citizens. Leadership traits, Types of leadership. Character/ Personality development. Civil defence organization, Types of emergencies, Fire-fighting, Protection. Maintenance of essential services, Disaster management, Aid during development projects.
- Basics of Social Service, Weaker sections of society and their needs, NGO's and their contribution, Contribution of youth towards Social welfare and Family planning.
- Structure and Function of human body, Diet and Exercise, Hygiene and Sanitation. Preventable diseases including AIDS, Safe blood donation, First aid, Physical and mental health. Adventure activities. Basic principles of Ecology, Environmental conservation, Pollution and its control.

TEACHING SCHEDULE

PRACTICAL [AEC-111]

Exercise No.	Exercise Topic	Exercise Sub-topics/ Titles	Weightage (%)
1-2	**Introduction to NCC**	Aims, Objectives, NCC Organizational structure, NCC Song, DG's Cardinals of Discipline.	4
3-5	**Drill Basics**	Aim of drill, General words of command, Positions of attention, Stand-at-ease and Stand-easy, Turning.	8
6-8	**Formation Drills**	Sizing, Numbering, Forming in three ranks, Open and Close order march and Dressing.	8
9-11	**Saluting Drills and Parade Movements**	Saluting at halt, Getting on parade, Dismissing and Falling-out.	8
12-14	**Marching Techniques**	Length of pace and time of marching in Quick/slow march, Side pace, Forward/rear pace, Turning on the march, Wheeling and Saluting on the march	10
15-17	**Squad Formation and Control**	Marking time, Forward march, Halt, Changing step, Formation of squad and Squad drill.	10
18-19	**Command and Control in NCC**	Organization, Badges of rank, Honours and Awards.	4
20-22	**Nation Building and Citizenship; Leadership**	Cultural heritage, Religions, Traditions, Customs of India, National integration, Values and Ethics, Communication, Leadership traits, Discipline and Motivation, Character/ Personality Development.	12
23-24	**Civil Defence and Emergency Management**	Types of emergencies, Fire fighting techniques, Maintenance of essential services, Disaster management and Aid during development projects, Civil Defence Organizations.	10
25-26	**Social Service and Youth Welfare**	Weaker sections of society, Role of NGOs, Youth participation in Social welfare and Family planning	8
27-29	**Health, Hygiene and First Aid**	Human body structure, Diet, Hygiene, Preventable diseases (including AIDS), Safe blood donation, First aid practices, Mental and Physical health.	10
30-32	**Environment and Ecology**	Basic Principles of Ecology, Environmental conservation, Pollution and its control, Adventure activities.	8
		Total =	**100**

Semester	**:**	**I**	
Course No.	**:**	**AEC-112**	**Credit Hrs. : 2(1+1)**
Course Title	**:**	**Communication Skills**	
Gradial Common Course across all UG Degrees			

SYLLABUS

Objectives:(i) To acquire competence in oral, written and non-verbal communication,

(ii) To develop strong personal and professional communication and

(iii) To demonstrate positive group communication.

THEORY

Communication Process: The magic of effective communication; Building self-esteem and overcoming fears; Concept, nature and significance of communication process; Meaning, types and models of communication; Verbal and Non-verbal communication; Linguistic and non-linguistic barriers to communication and reasons behind communication gap/ miscommunication. Basic Communication Skills: Listening, Speaking, Reading and Writing Skills; Precis writing/Abstracting/Summarizing; Style of technical communication, Curriculum vitae/resume writing; Innovative methods to enhance vocabulary, analogy questions; Structural and Functional Grammar: Sentence structure, modifiers, connecting words and verbals; Phrases and clauses; Case: subjective case, possessive case, objective case; Correct usage of nouns, pronouns and antecedents, adjectives, adverbs and articles; Agreement of verb with the subject: tense, mood, voice; Writing effective sentences; Basic sentence faults.

PRACTICAL

Listening and note taking; Writing skills: précis writing, summarizing and abstracting; Reading and comprehension (written and oral) of general and technical articles; Micro-presentations and Impromptu Presentations: Feedback on presentations; Stage manners: grooming, body language, voice modulation, speed; Group discussions; Public speaking exercises; Vocabulary building exercises; Interview techniques; Organization of events.

TEACHING SCHEDULE

THEORY [AEC-112]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1	**Communication Process: The Magic of Effective Communication**	Elements of Communication process such as Communicator, Message, Channel treatment of message, Audience and Audience response.	5
2	**Building Self-esteem and Overcoming Fears**	Points to build Self-esteem, Build social connections, Encourage yourself, Focus on solutions and Set realistic goals, Strategies to overcome fears, Practice, Visualise Success, Preparation, Know your audience, Seek feedback and Active listening.	5
3	**Communication**	Concept, Nature and Significance of Communication process	10
4		Meaning, Types and Models of communication	10
5		Verbal and Non-verbal communication, Linguistic and Non-linguistic communication	10
6		Barriers to communication and Reasons behind communication gap/ miscommunication	5
7	**Basic Communication Skills**	Listening, Speaking, Reading, Writing skills	5
8		Précis writing/ Abstracting/ summarizing- Styles of technical communication, Curriculum Vitae/resume writing	10
9		Innovative methods to enhance vocabulary, analogy questions	5
10	**Structural and Functional Grammar**	Sentence structure, modifiers, connecting words and verbal; Phrases and Clauses	5
11		Case: Subjective case, Possessive case, Objective case	5
12		Correct usage of nouns, Pronouns and Antecedents	5
13		Adjectives, Adverbs and Articles	5
14		Agreement of verbs with the subject: Tense, Mood, Voice	5
15		Writing effective sentences	5
16		Basic sentence faults	5
		Total =	**100**

TEACHING SCHEDULE

PRACTICAL [AEC-112]

Exercise No.	Exercise Topic/ Title
1	Listening and Note taking
2	Writing skills- Précis writing
3	Writing skills- Abstracting
4	Writing skills- Summarizing
5	Reading and Comprehension (written and oral) of general and technical articles
6	Micro-presentations
7	Impromptu presentations
8	Feedback on presentations
9	Stage manners- Grooming
10	Stage manners- Body language
11	Stage manners- Voice modulations, Speed
12	Group discussions
13	Public speaking exercise
14	Vocabulary building exercises
15	Interview techniques
16	Organisation of events

Suggested Readings:

1. Allport, G W, 1937. Personality: A Psychological Interpretation. Holt, New York.
2. Brown Michele & Gyles Brandreth, 1994, How to Interview and be Interviewed. Sheldon Press, London.
3. Carnegie Dale, 1997. The Quick and Easy Way to Effective Speaking. Pocket Books, New York.
4. Francis Peter S J, 2012. Soft Skills and Professional Communication. Tata McGraw Hill, New Delhi.
5. Kumar S and Pushpa Lata, 2011. Communication Skills. Oxford University Press.
6. Neuliep James W, 2003. Intercultural Communication- A Contextual Approach. Houghton Mifflin Co Boston.
7. Pease, Allan, 1998, Body Language. Sudha Publications, Delhi.
8. Raman M and Singh P, 2000. Business Communication. Oxford University Press.
9. Ray G L, 2008. Extension, Communication and Management. Kalyani Publishers, Ludhiana
10. Ray G. Land Mondal Sagar, 2012. Textbook on Rural Development Entrepreneurship and Communication Skills. Kalyani Publishers, Ludhiana.
11. Seely J, 2013, Oxford Guide to Effective Writing and Speaking. Oxford University Press.
12. Thomson A J and Martinet A V, 1977, A Practical English Grammar. Oxford University.

Semester	**:**	**I**			
Course No.	**:**	**MDC-111**	**Credit Hrs.**	**:**	**3(2+1)**
Course Title	**:**	**Farming-based Livelihood Systems**			
Gradial Common Course across all UG Degrees					

SYLLABUS

Objectives: (i) To make the students aware about farming-based livelihood systems in Agriculture,

(ii) To disseminate the knowledge and skills that how farming-based systems can be a source of livelihood.

THEORY

Status of Agriculture in India and different States, Income of farmers and rural people in India, Livelihood- Definition, Concept and Livelihood patterns in urban and rural areas, Different indicators to study livelihood systems. Agricultural Livelihood Systems (ALS): Meaning, approach, approaches and framework, Definition of farming systems and farming-based livelihood systems, Prevalent Farming systems in India contributing to livelihood. Types of traditional and modern farming systems. Components of farming system/ farming-based livelihood systems: Crops and cropping systems, Livestock, (Dairy, Piggery, Goatry, Poultry, Duckry etc.), Horticultural crops, Agroforestry systems, Aquaculture, Duck/Poultry-cum-Fish, Dairy-cum-Fish, Piggery-cum-Fish etc.; Small, medium and large enterprises including value chains and secondary enterprises as livelihood components for farmers, Factors affecting integration of various enterprises of farming for livelihood. Feasibility of different farming systems for different agro-climatic zones, Commercial farming-based livelihood models by NABARD, ICAR and other organizations across the country; Case studies on different livelihood enterprises associated with the farming. Risk and success factors in farming-based livelihood systems, Schemes and programs by Central and State Governments; Public and Private organizations involved in promotion of farming-based livelihood opportunities. Role of farming-based livelihood enterprises in 21st Century in view of circular economy, green economy, climate change, digitalization and changing lifestyle.

PRACTICAL

Survey of farming systems and agriculture-based livelihood enterprises, Study of components of important farming-based livelihood models/systems in different agro-climatic zones, Study of production and profitability of crop based, livestock based, processing-based and integrated farming-based livelihood models, Field Visit of innovative farming system models. Visit of Agri-based enterprises and their functional aspects for integration of production, processing and distribution sectors and Study of agri-enterprises involved in industry and service sectors (Value Chain Models), Learning about concept of project formulation on farming-based livelihood systems along with cost and profit analysis, Case study of Start-Ups in agri-sectors.

TEACHING SCHEDULE

THEORY [MDC-111]

Lecture No.	Topic	Sub-topics/Key Points	Weightage (%)
1	Status of Agriculture in India	Historical background, Current status, Role of Agriculture in Indian Economy	4
2	Status of Agriculture in Different States	State-wise scenario, Major crops, Regional diversity	4
3	Income of Farmers and Rural People in India	Factors affecting income, Rural-urban income gap, Government initiatives	4
4	Livelihood: Definition, Concept, and livelihood Patterns in urban and rural areas	Livelihood-Definition and its Concept, Urban vs Rural livelihood patterns, Sources of income	4
5	Different Indicators to Study Livelihood Systems	Economic, Social and Environmental indicators, Measuring livelihood resilience	4
6	Agricultural Livelihood Systems (ALS): Meaning and Approaches	Definition, Significance of ALS, Integrated farming systems, Approaches	4
7	ALS Framework and Case studies	Framework for ALS, Case studies in India	4
8	Definition of Farming Systems and farming based Livelihood Systems	Definition and Role of farming systems in rural livelihoods, Examples of systems	4
9	Prevalent Farming Systems in India contributing to livelihood	Traditional vs. Modern farming systems, Regional differences	4
10	Types of Traditional and Modern Farming Systems	Types; Differences; Strengths, Limitations, Case studies	4
11	Components of farming system/farming-based livelihood systems - Crops and Cropping Systems	Components, Crop diversification, Cropping pattern, Mixed cropping, Importance for rural livelihoods	4
12	Livestock-based Farming Systems	Importance and Management of dairy, piggery, poultry, goatry, duckry, etc.	4
13	Horticultural Crops and Livelihoods	Role of fruits, vegetables and spices in rural income generation	4
14	Agroforestry Systems	Agroforestry- Definition, Combining trees and crops, Agroforestry models in India	2
15	Aquaculture as a Livelihood System	Importance of Aquaculture, Integrated systems (e.g. Duck/Poultry-cum-Fish, Dairy-cum-Fish, Piggery-cum-Fish etc.)	4
16	Challenges in Aquaculture-based Systems	Feasibility, Government support and Market access	2

Continued…

17	Small Enterprises in Farming	Role of small enterprises, Value addition, Local processing	2
18	Medium and Large Enterprises in Farming	Value chains, Secondary enterprises as livelihood components for farmers, Agri-processing.	2
19	Factors affecting Integration of various enterprises of farming for livelihood	Technology, Market access, Credit and infrastructure challenges etc.	4
20	Strategies for Enterprise Integration	Successful integration, Government policies, Examples.	2
21	Overview of Agro-Climatic Zones in India	Characteristics of different zones and their agricultural potential.	2
22	Feasibility of different Farming Systems for different Agro-Climatic Zones	Suitable farming systems for different zones, Climate adaptation.	2
23	Commercial Farming Based Livelihood Models by NABARD, ICAR and other organizations across the country	Role of NABARD, ICAR and other Organizations in promoting commercial models, Successful cases.	4
24	Case studies on different Livelihood Enterprises associated with farming	Analysis of successful enterprises, Dairy Cooperatives etc.	4
25	Risk Factors in Farming-based Livelihood Systems	Climate, Market fluctuations, Input costs; Mitigation strategies etc.	4
26	Success Factors in Farming-based Livelihood Systems	Innovation, Market access, Government support, Social capital etc.	2
27	Schemes and Programmes by the Central Government	Overview of schemes like, PM-KISAN, National Rural Livelihood Mission.	2
28	Schemes and programmes by State Governments	State-specific programs promoting rural livelihoods, Case examples.	2
29	Role of Private Sector in Livelihood Promotion	Public-Private Partnerships, Role of private agribusiness.	2
30	Public-Private Partnerships in Agriculture	Successful collaborations in rural development and farming systems	2
31	Farming-based Livelihoods in the 21st Century	Circular economy, Green economy, Climate change, Sustainability.	2
32	Impact of Digitalization and Changing Lifestyles	Technology in Agriculture, Future prospects for rural livelihoods.	2
		Total =	**100**

TEACHING SCHEDULE

PRACTICAL [MDC-111]

Exercise No.	Exercise Topic	Exercise Sub-topics/ Titles
1	Survey of Farming Systems and Agriculture-based Livelihood Enterprises	Methods of data collection; Field survey techniques; Preparing reports on surveyed farms.
2	Study of Components of Farming-based Livelihood Models in Different Agro-Climatic Zones	Components: Crop, Livestock, Fishery, Agroforestry; Identifying models suited to specific zones.
3	Study of Production and Profitability of Crop-based Models	Analysis of input-output relations; Identifying profitable crops
4	Study of Livestock-based Models	Livestock systems: Dairy, poultry, goat farming; Profitability and market access
5	Study of Processing-based Models	Value addition in agriculture; Studying small-scale food processing units
6	Study of Integrated Farming-based Models	Study of crop-livestock-aquaculture integration; Synergies and challenges
7	Field Visit to Innovative Farming System Models	Visit to farms using modern technologies; Documenting practices
8	Visit to Agri-based Enterprises	Enterprises involved in input supply or value addition
9	Study of Functional Aspects: Integration of Production, Processing and Distribution	Backward and forward linkages; Assessing supply chain models
10	Agri-Enterprises in Industry and Service Sectors (Value Chain Models)	Studying value chain enterprises; Evaluating sustainability models
11	Concept of Project Formulation on Farming-based Livelihood Systems	Identifying project objectives; Structuring budgets and timelines
12	Cost and Profit Analysis of Farming-based Livelihood Projects	Developing Cost-Benefit analysis; Identifying Break-Even points
13	Case Study of Start-ups in Agri-sectors	Analysing real-world Start-ups; Identifying success factors
14	Group Project: Develop a Farming-based Livelihood Model	Formulating a working model; Feasibility and sustainability analysis
15	Preparation of Report on Farming Systems Survey and Livelihood Models	Compiling field data; Preparing reports with recommendations
16	Presentation and Evaluation of Practical Project Reports	Group presentations; Internal assessment of reports and participation

Suggested Readings [MDC-111]:

1. **Ashley, C., & Carney, D. (1999)**. *Sustainable Livelihoods: Lessons from Early Experience.* Department for International Development, London, UK.
    - **Relevance**: This book explores sustainable livelihood frameworks, which are key to understanding livelihood patterns and rural income systems.
2. **Agarwal, A., & Narain, S. (1989)**. *Towards Green Villages: A Strategy for Environmentally Sound and Participatory Rural Development.* Centre for Science and Environment, New Delhi, India.
    - **Relevance**: Provides strategies for participatory rural development, focusing on environmental sustainability—a core concept in farming systems.
3. **Carloni, A. (2001)**. *Global Farming Systems Study: Challenges and Priorities to 2030 – Regional Analysis: Sub-Saharan Africa.* FAO, Rome, Italy.
    - **Relevance**: Offers insights into global farming system challenges, with lessons that can be adapted for Indian contexts in agricultural development.
4. **Dixon, J., Gulliver, A., & Gibbon, D. (2001)**. *Farming Systems and Poverty: Improving Farmers' Livelihoods in a Changing World.* FAO & World Bank, Rome & Washington, DC.
    - **Relevance**: Focuses on farming systems' role in poverty alleviation and rural livelihood improvement.
5. **Evenson, R.E. (2000)**. *Agricultural Productivity and Production in Developing Countries.* In *FAO, The State of Food and Agriculture.* FAO, Rome, Italy.
    - **Relevance**: Discusses agricultural productivity, a critical factor in sustainable farming and improved livelihoods.
6. **Bhatt, B.P., *et al*. (ICAR Research Complex for Eastern Region)**. *Livelihood Improvement of Underprivileged Farming Community: Experiences from Bihar.* Patna, Bihar.
    - **Relevance**: Case studies on improving livelihoods in rural India, relevant to learning about region-specific agricultural interventions.
7. **Panwar *et al.* (2020)**. *Integrated Farming System Models for Agricultural Diversification, Enhanced Income, and Employment.* Indian Council of Agricultural Research, New Delhi.
    - **Relevance**: Provides models for agricultural diversification and income enhancement, which align with farming system topics.
8. **Reddy, S.R. (2016)**. *Farming System and Sustainable Agriculture.* Kalyani Publishers, New Delhi.
    - **Relevance**: Covers sustainable agriculture principles and farming system models, essential for sustainable livelihood systems.
9. **Singh, J.P. *et al*. (2016)**. *Region Specific Synthesized Integrated Farming System Models for Improved Production, Profitability and Nutrition (Series-1).* Bulletin, ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut (U.P.).
    - **Relevance**: Discusses integrated farming models tailored to different agro-climatic regions of India, essential for practical learning.
10. **Walia, S.S., & Walia, U.S. (2020)**. *Farming System and Sustainable Agriculture.* Scientific Publishers, Jodhpur, Rajasthan.
    - **Relevance:** Provides insights into sustainable agricultural practices and integrated farming systems with regional focus.

Semester	**: I (New)**	
Course No.	**: MATH-111***	**Credit Hrs. : 2(2+0) Need-based; G**
Course Title	**: Basic Mathematics**	
***Gradial** Need-based Course only for **B.Sc. (Hons.) Agri-Business Management**		

SYLLABUS

Objectives:

(i) To introduce the basic principles and functions in Mathematics,
(ii) To study differentiation and integration,
(iii) To study matrices and determinants.

THEORY

Algebra: Progressions: Arithmetic Progression: Definition, Sum of n terms, Examples. Geometric Progression: Definition, sum of n terms, Examples. Harmonic Progression: Definitions, Examples.

Determinants: Definition of Determinant, Expansion of determinant up to 3rd order, Examples; Properties of determinants up to 3rd order (without proof).

Matrices: Definition of Matrices, Order of Matrix, Types of Matrices, Algebra of Matrices: Addition, Subtraction, Multiplication, Examples, Transpose of Matrix and it's properties (without proof).

Differential Calculus: Definition, Differentiation of function using first principle, Examples. Rules of Differentiation: Derivatives of sum, difference, product and quotient of two functions (Formulae only), Derivative of Standard Functions: Algebraic Function, Trigonometric, Logarithmic and Exponential Functions (Formulae only), Examples. Increasing and Decreasing Functions, Growth rate, Average cost, Marginal cost, and Marginal revenue. Examples.

Partial Differentiation: Definition, Homogeneous function, Euler's theorem, Examples. Maxima and Minima of the functions of the form y = f (x) and y = f (x1, x2), Examples.

Integral Calculus: Definition of Indefinite and Definite Integrals, Integrals of elementary functions (Formulae only), Theorems of integration (without proof), Integration by substitution, Examples. Integration by parts, Examples, Application of Integration: To find Area under simple well-known curves (Simple problems based on it).

Mathematical Models: Agricultural systems - Mathematical models - Classification of mathematical models- Fitting of Linear, Quadratic and Exponential models to experimental data.

Suggested Readings:

1. NCERT, 2012, Mathematics of Class XII, NCERT, India.
2. A Textbook of Mathematics XI and XII (Part I and II) Maharashtra State Board of Secondary and Higher Secondary Education, Pune.
3. Sharma RD, 2014, Mathematics of Class XII, Dhanpat Rai Publisher.

TEACHING SCHEDULE

THEORY [MATH-111]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1 - 3	**Algebra: Progressions**	Arithmetic Progression: Definition, Sum of n terms, Examples.	10
		Geometric Progression: Definition, Sum of n terms, Examples. Harmonic Progression: Definitions, Examples.	
3 - 6	**Determinants**	Definition of Determinant, Expansion of determinant up to 3^{rd} order, Examples.	10
		Properties of determinants up to 3^{rd} order (without proof)	
6 - 12	**Matrices**	Definition- Matrices, Order of Matrix, Types of Matrices	20
		Algebra of Matrices: Addition, Subtraction, Multiplication, Examples.	
		Transpose of Matrix and it's Properties (without proof)	
		Inverse of Matrix up to 3^{rd} order by Adjoint method, Examples.	
13 - 20	**Differential Calculus**	Definition, Differentiation of function using First Principle, Examples.	20
		Rules of Differentiation: Derivatives of sum, Difference, Product and quotient of two functions (Formulae only), Derivative of Standard Functions: Algebraic Function, Trigonometric, Logarithmic and Exponential Functions (Formulae only), Examples.	
		Increasing and Decreasing Functions,	
		Growth rate, Average cost, and Marginal cost, Marginal revenue. Examples.	
21 - 23	**Partial Differentiation**	Definition, Homogeneous function, Euler's theorem, Examples.	10
		Maxima and Minima of the functions of the form- y = f (x) and y = f (x1, x2), Examples.	
24 - 30	**Integral Calculus**	Definitions of Indefinite and Definite Integrals.	20
		Integrals of elementary functions (Formulae only)	
		Theorems of integration (without proof).	
		Integration by substitution, Examples.	
		Integration by parts, Examples.	
		Application of Integration: to find Area under simple well-known curves (Simple problems based on it).	
31 - 32	**Mathematical Models**	Agricultural systems - Mathematical models - classification of mathematical models- Fitting of Linear, Quadratic and Exponential models to experimental data.	10
		Total =	**100**

Semester	**:**	**I**		
Course No.	**:**	**BOT-111****	**Credit Hrs. : 2(2+0)**	**Need-based; G/NG**
Course Title	**:**	**Basic Botany**		
Need-based Common Course among 3 UG Degrees: **B.Tech. (Biotech.) - Gradial / B.Sc. (Hons.) A.B.M. - Gradial / B.Tech. (Food Tech.) - Non-Gradial				

SYLLABUS

Objectives:
i. To study the basic taxonomy and classification of plants,
ii. To study the features of plant kingdom and morphology,
iii. To study the internal structures of plants.

THEORY

Plant Kingdom and Features of each group. Plant taxonomy, Systems of classification. Morphology, Modifications and Functions of Root, Stem, Leaf, Flower and Inflorescence. Pollination and Fertilization. Fruit types. Structure of dicot and monocot seed, and seed germination. Cell structure. Chromosome, DNA and Genes. Cell and tissue types. Internal structure of root, stem and leaf. Characteristics and economic importance of Poaceae, Brassicaceae, Fabaceae, Malvaceae, Rutaceae, Rosaceae, Asteraceae and Solanaceae families.

TEACHING SCHEDULE

THEORY [BOT-111]

Lecture No.	Topics	Sub-topics/ Key Points	Weightage (%)
1-3	**Plant Kingdom and Features:**	Classification of Plant Kingdom (Major plant groups: Bryophytes, Pteridophytes, Gymnosperms, and Angiosperms.) Key distinguishing features/ Characteristics of each group with examples. Plantae Kingdom.	8
4-5	**Plant Taxonomy and Systems of Classification:**	Binomial nomenclature and other systems of classification (in brief)	5
6-7	**Plant Cell and Tissue Types:**	Basic Structure of a Plant Cell and Tissue, Types of Plant Cells and Tissues; Plant Cell Functions.	8
8-9	**Chromosome:**	Definition and Overview, Chemical Composition; Chromosome Morphology, Types of Chromosomes.	8

Continued…

10-11	**DNA:**	Brief historical overview of DNA discovery, Watson-Crick model of DNA, Chemical composition, Components of a nucleotide, Structures of Purines and Pyrimidines.	8
12	**Genes:**	Definitions (Gene, Allele, Genotype, Phenotype, Exon, Intron, Codon) and Historical Overview; Structure: Basic layout of a gene- (Exon, Intron, etc.); Types of genes, Codons (Start/ Stop).	8
13-14	**Pollination and Fertilization:**	Definitions/Terminology, Types, Agents of pollination, Processes/Events, Significances, Barriers to Fertilization, Differences between their types.	10
15-16	**Root and Stem:**	Morphology, Modifications with examples and Functions	8
17-19	**Leaf, Flower and Inflorescence:**	Morphology, Modifications with examples and Functions	8
20	**Fruits:**	Types of fruits with examples	3
21-22	**Structures of Monocot and Dicot Seeds:**	Structure, Diagrams, Differences	5
23-24	**Seed Germination:**	Definitions, Types, Differences and Stages of seed germination	5
Plant taxonomy-Classification; Characteristics and Economic Importance; Members/ Examples of following Families viz.,			
25-26	Poaceae and Brassicaceae		4
27-28	Fabaceae and Malvaceae		4
29-30	Rutaceae and Rosaceae		4
31-32	Asteraceae and Solanaceae		4
		Total=	**100**

Suggested Readings [BOT-111]:

1. Bendre AM and Kumar A, 1999, Textbook of Practical Botany. Vol. 2, 7th Edn, Rastogi Publications.
2. Bendre AM and Pande PC, 2009, Introduction to Botany, Rastogi Publications.
3. Bhatia KN and Tyagi MP, 2020, Elementary Biology. A Truemen Publication.
4. David M Hillis, H Craig Heller, Sally D Hacker, David W Hall, David E Sadava, 2020. (eBook) Life: The Science of Biology, 12th Edn, Sunderland Publication.
5. Dutta AC, 1995, A Class-Book of Botany, 16th Edn, Oxford University Press.
6. NCERT, 2021. Biology of Class XI. NCERT, India.
7. Pande PC and Jain DK, 2022, A Textbook of Botany Angiosperm. S. Chand Publications.

Semester	**:**	**I**		
Course No.	**:**	**ABM-111**	**Credit Hrs.** **:**	**2(2+0)**
Course Title	**:**	**Introduction to Agri-Business Management**		

SYLLABUS

Objectives:

(i) To gain a comprehensive understanding of agribusiness structures, functions, a and dynamics;

(ii) To develop essential management skills applicable to agricultural enterprises;

(iii) To explore strategies for optimizing production efficiency and maximizing profitability in agribusiness; and

(iv) To prepare for diverse careers in farm management, agricultural marketing, finance, and consulting.

THEORY

Indian Agriculture: Place of Agriculture in Indian Economy, Trends in the structure of Indian Economy Role of Agriculture in Economic Development in India. Trends in agricultural production and productivity, cropping pattern size of farms and farm efficiency. Functions of Management: Planning, organizing, staffing, motivation and control and Principles of Management. Indian Agriculture; Impact of Liberalization, Privatization and Globalization on Agribusiness sector. Agribusiness Management: Definition, Importance, Scope of Agribusiness Management, Nature and Functions. Agribusiness input and output services, Agricultural credit and foreign trade, Planning and Organizing agribusiness. New trends in Agribusiness: Contract farming, Types and Scope of contract farming, Working of Contracts, Contract Models, Organic Farming, Genetically Modified Food, Farmer Producers' Organizations (FPO) Case Studies.

TEACHING SCHEDULE

THEORY [ABM-111]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1-3	Indian Agriculture	Place of Agriculture in Indian Economy, Trends in the structure of Indian Economy, Role of Agriculture in Economic Development in India	10
4		Trends in Agricultural Production and Productivity	6
5		Cropping pattern, Size of farms and Farm efficiency	
6	Functions of Management-Planning	Meaning, Importance and Characteristics	4
7	Directing	Meaning, Importance and Principles	4
8	Organizing	Meaning, Nature/ Characteristics, Purpose	4
9	Staffing	Meaning, Objectives, Importance, Process of Selection	4
10	Controlling	Meaning, Nature, Characteristics and Importance	4
11-13	Principles of Management	Principles of Management-Meaning, Evolution, Features, Levels of Management, Roles of Manager, Managerial Skills	12
14-15	Indian Agriculture	Impact of Liberalization, Privatization, Globalization on Agribusiness sector	6
16-18	Agri-business Management	Definition, Importance, Scope, Nature, Functions of Agri-business Management	6
19-20	Agri-business	Input services, Output services	6
21	Agricultural Credit	Trends of Agricultural Credit in India, Agricultural Credit Policy	6
22	Agricultural Foreign Trade	Importance, Policy, Trade Organizations	

Continued…

23-24	Planning and Organizing Agri-business	Business Planning; Market Analysis, Financial Planning, Legal considerations, Organizational Structure, Financial & Risk Management	4
25-28	New Trends in Agri-business	Contract farming, Definitions, Types and Scope of contract farming, Working of contracts, Contract models	12
29	Organic Farming	Characteristics of Organic Farming, Principles of Organic Farming	2
30	Genetically Modified Food	Definition, Examples, Indian Scenario	4
31 -32	Farmer Producers' Organizations (FPO)	Definition, Introduction, Importance, Organisation, Functions; Case Studies (Two only)	6
		Total=	**100**

Suggested Readings [ABM-111]:

1. A Handbook of Agribusiness- S.C. Gaur and D. Singh
2. A Textbook of Agri-business Management- Sanket S. Kadam, Universal Prakashan, Pune.
3. Indian Agriculture and Agri-business Management, Dr. Smita Diwase, Krishi Resource Management Network.
4. Farm Business Management: The Fundamentals of Good Practice by Peter L Nuthall.
5. Fundamentals of Agribusiness Finance by Ralph W. Battles and Robert C. Thompson.
6. Objective Agri-business Management by S.R. Panigrahy.
7. Agri-business: Management, Marketing, Human Resource Development, Communication, and Technology by Robert H. Usry and Lanny W. Hass
8. Agri-business and Market Management by Amod Sharma.

Semester	**:**	**I**		
Course No.	**:**	**ECON-111**	**Credits Hrs. :**	**2(2+0)**
Course Title	**:**	**Fundamentals of Agricultural Economics**		

SYLLABUS

Objectives:

(i) To understand the fundamental principles of economics as they apply to Agriculture,

(ii) To analyze the economic factors influencing agricultural production, distribution and consumption,

(iii) To explore the role of government policies and international trade in shaping the agricultural economy,

(iv) To develop critical thinking skills to evaluate and address economic challenges and opportunities in Agriculture.

THEORY

Agricultural Economics: Meaning, Definition, Characteristics of Agriculture, Nature and Scope of Agricultural Economics, Distinction between Agriculture and Industry, Role of Agriculture in economic development, Role of Government Interventions in Agricultural development. Planning and Agricultural Development: Meaning and Objectives, Economic planning, Benefits of planning, Agricultural development during different Five-year Plans in India, Measures of reorganization of agriculture and NITI Aayog. Factors of production: Meaning of land and its Characteristics, Labour concept, Characteristics of labour and Efficiency of labour, Capital concept and its Characteristics, Forms of capital in Agriculture and Process of capital formation, Organization of business firms, Forms of business organizations and their characteristics. Land reforms: Land reforms and Land tenure systems, Concepts of agricultural land holdings in India. Theory of production: Meaning, Definition, Types of production functions, Laws of Diminishing Marginal Returns and Elasticity of production. Scale of production: Meaning, Classification and Economies of scale. Theory of costs: Meaning, Definitions and Different types of costs and their Measurement. Revenue concept: Total revenue, Average revenue, Marginal revenue and Profit maximization.

TEACHING SCHEDULE

THEORY [ECON-111]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1-2	Agricultural Economics	Meaning, Definition, Characteristics of Agriculture, Nature and Scope of Agricultural Economics	10
3	Distinction between Agriculture and Industry	Distinction between Agriculture and Industry	2
4-5	Role of Agriculture	Role of Agriculture in economic development, Role of Government interventions in agricultural development	8
6-7	Planning and Agricultural Development	Meaning and Objectives, Economic planning, Benefits/ Importance of planning,	4
8-11	Agricultural Development during different Five-Year Plans in India	Plan period, Outlay Share, Growth rates and Achievements in the field of Agriculture in brief	8
12-13	Measures of Reorganization of Agriculture	Measures of reorganization of Agriculture	2
14-16	NITI Aayog	History of Planning Commission, NITI Aayog, Organization, Working, Role for Agricultural development	8
17-20	Factors of Production	Meaning of land and its characteristics, Labour concept, Characteristics of labour and Efficiency of labour, Capital concept and its characteristics, Forms of capital in Agriculture and Process of capital formation, Organization of business firms, Forms of business organizations and their characteristics.	10
21-22	Land Reforms	Land reforms, Land tenure systems, Concepts of agricultural land holdings in India	8
23-24	Theory of Production	Meaning, Definition, Types of Production functions	8

Continued…

25-26	Laws of Diminishing Marginal Returns and Elasticity of Production	Laws of Diminishing Marginal Returns and Elasticity of production	8
27-28	Scale of Production	Meaning, Classification and Economies of scale	10
29-30	Theory of Costs	Meaning, Definitions and Different types of costs and their measurement	10
31-32	Revenue Concept	Total revenue, Average revenue and Marginal revenue and Profit maximization	4
		Total=	**100**

Suggested Readings [ECON-111]:

1. Agriculture Economics by Shubha Reddy.
2. Finance by Shubha Reddy.
3. Economic of farm production and management by V.T. Raju and V.S. Rao.
4. Agricultural marketing in India by S.S. Acharya and N.L. Aggarwal.
5. Modern Microeconomics by Koutsoyiannis.

Semester	**:**	**I**		
Course No.	**:**	**AGRO-111**	**Credits Hrs. :**	**2(1+1)**
Course Title	**:**	**Introduction to Agronomy and Crop Production Technology**		

SYLLABUS

Objectives :

(i) To understand the principles of Agronomy and Crop Production Technology,

(ii) To learn about crop growth and development, including factors influencing yield and quality,

(iii) To explore sustainable and efficient farming practices to enhance crop productivity while minimizing environmental impact,

(iv) To gain practical knowledge of crop management techniques, including soil fertility, pest control and irrigation.

THEORY

Agriculture, Agronomy and their Scope, Tillage and Tilth, Crop density and Geometry, Factors affecting growth and development, Crops and Cropping systems, Crop rotation and its principles, Manures and Fertilizers, Irrigation, Water resources, Crop water requirement, Water Use Efficiency, Irrigation-scheduling criteria and methods, Quality of irrigation water, drainage. Weeds - Importance, Classification, Crop weed competition, Concepts of weed management- Principles and methods, Herbicides. Origin, Geographical distribution, Economic importance, Soil and Climatic requirements, Varieties, Cultural practices and Yield of *Kharif* crops viz., Rice, Maize, Sorghum, Minor millets, Pigeon pea, Mungbean, Groundnut and Soybean. *Rabi* crops viz., Sorghum, Wheat, Chickpea, Rapeseed and Mustard, Sunflower; and Sugarcane, Cotton, Tobacco, Chilli.

PRACTICAL

Identification of crops, seeds, fertilizers, herbicides and tillage implements, Identification of weeds in crops, Methods of herbicide and fertilizer application, Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement, Methods of irrigation. Methods of sowing of different crop. Nutrient function and deficiency. Top dressing and foliar feeding of nutrients. Study of yield contributing characters and yield calculation of important crops. Visit to research centres of related crops.

TEACHING SCHEDULE

THEORY [AGRO-111]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1	Agriculture, Agronomy	Definitions: Agriculture, Agronomy, Scope. Tillage: Definition, Objects of tillage, Types of tillage, Tilth: Definition and Characteristics of ideal tilth.	8
2	Crop Density and Geometry	Crop density and Geometry concept, Factors affecting growth and crop development, Cropping systems-types, Crop rotation- Concept and its Principles.	6
3	Manures and Fertilizers, Role of plant nutrients	Manures and Fertilizers - Meaning, Classification of manures and fertilizers, Role of plant nutrients.	8
4	Irrigation, Water resources	Irrigation meaning, Water resources of India, Crop water requirements, Water use efficiency: Concept, Irrigation efficiencies: Def'ns/Concept.	6
5	Criteria and Methods of irrigation	Criteria for scheduling of irrigation, Methods of irrigation, Advantages and Disadvantages.	8
6	Water quality parameters and Drainage	Quality of irrigation water. Drainage: Concept and importance, Types of drainage, Factors affecting drainage.	4
7	Weeds	Weed- Definition, Importance, Merits and Demerits, Classification of weeds, Meaning of crop-weed competition.	6
8	Concept of Weed Management	Principles and Methods of weed management viz., Cultural, Mechanical, Chemical, Biological Weed control methods and IWM concept, Classification of herbicides.	8
9-12	Production Technology of *Kharif* crops	Origin, Geographical distribution, Economic importance, Soil and Climatic requirements, Varieties, Cultural practices and Yield of: Rice, Maize, Sorghum, Minor millets, Pigeon pea, Mung bean, Groundnut and Soybean.	6

Continued…

13-16	Production technology of *Rabi* crops	Origin, Geographical distribution, Economic importance, Soil and Climatic requirements, Varieties, Cultural practices and Yield of: Sorghum, Wheat, Chickpea, Rapeseed, Mustard and Sunflower.	4
17	Sugarcane Production Technology	Origin, Geographical distribution, Economic importance, Soil and Climatic requirements, Varieties, Cultural practices and Yield	8
18	Production Technology of Chilli	Origin, Geographical distribution, Economic importance, Soil and Climatic requirements, Varieties, Cultural practices and Yield	6
19	Production Technology of Tobacco and Cotton	Origin, Geographical distribution, Economic importance, Soil and Climatic requirements, Varieties, Cultural practices and Yield	4
		Total=	**100**

TEACHING SCHEDULE

PRACTICAL [AGRO-111]

Exercise No.	Exercise Title
1	Identification of crops and seeds.
2	Identification of fertilizers.
3	Identification of herbicides.
4	Identification of tillage implements.
5	Identification of weeds in crops.
6	Study methods of herbicide and fertilizer application.
7	Numerical exercises on fertilizer requirement.
8	Numerical exercises on calculation of plant population.
9	Numerical exercises on calculation of herbicide requirement.
10	Numerical exercises on calculation of water requirement.
11	Study of different methods of irrigation.
12	Study of methods of sowing of different crops.
13	Study of nutrient functions and deficiencies.
14	Study of top dressing and foliar feeding of nutrients.
15	Study of yield contributing characters and yield calculation of important crops.
16	Visit to Research Centers of related crops.

Suggested Readings [AGRO-111]:

1. Principles of Agronomy by T.Y. Reddy and G.H. Sankara Reddi:

   Relevance: This book provides a comprehensive overview of agronomic principles, including crop production techniques, soil management, and crop physiology.

2. Fundamentals of Crop Production by Stephen R. Kaffka and Larry L. Strand:

   Relevance: This textbook covers the basics of crop production, including plant growth and development, crop management practices, and environmental factors affecting crop yield.

3. Introduction to Agricultural Engineering Technology: A Problem-Solving Approach by Harry L. Field and John B. Solie:

   Relevance: This book offers insights into the technological aspects of agronomy, including machinery, irrigation systems and precision agriculture techniques.

4. Crop Production: Evolution, History, and Technology by C. Wayne Smith and Julian R. Betters:

   Relevance: This book explores the history and evolution of crop production technologies, providing a broader context for understanding modern agronomic practices.

Semester	**:**	**I**		
Course No.	**:**	**GPB-111**	**Credits Hrs. :**	**2(1+1)**
Course Title	**:**	**Introduction to Genetics and Plant Breeding**		

SYLLABUS

Objectives:

(i) To understand the principles of Genetics and their application in Plant Breeding,

(ii) To learn about breeding techniques used to improve crop traits such as yield, its quality and disease resistance,

(iii) To explore the importance of genetic diversity and its role in crop improvement and adaptation to changing environments,

(iv) To develop skills to evaluate and select superior plant genotypes for breeding programs aimed at enhancing agricultural productivity and sustainability.

THEORY

History of Genetics and Plant Breeding, Study of Chromosome- Structure and Functions, Cell Division, Mendel's Laws of inheritance, Modes of inheritance- Monogenic, Polygenic, Cytoplasmic. Modes of reproduction and their significance in Plant Breeding, Modes of Pollination, Self incompatibility, Male sterility and their significance in Plant Breeding, Breeding for Self-pollinated crops- Mass, Pure line, Pedigree method and Bulk method; Breeding for Cross-pollinated crops- Ear to row method, Backcross method, Development of Synthetics, Development of Composites and Hybrids; Vegetative Propagated Crops viz., Clonal selection.

PRACTICAL

Study of Microscopy, Simple and compound microscopes, Mendelian ratios- Monohybrid, Dihybrid and Problems related to segregation and independent assortment, Study of floral biology and structure of a model flower, Study of floral structure and biology of important cereals, Study of floral structure and biology of important pulses and oil seeds, Study of floral structure and biology of important commercial crops, Study of Plant Breeder's kit, Selfing and crossing techniques, Male sterility: A, B and R lines and their utility, Pollen, fertility study and its importance, Study of germplasm of various crops, Problems in hybrid seed production, Layout of field experiments, Principles, data recording and elementary statistics and analysis of data, Visit to different crop breeding schemes.

TEACHING SCHEDULE

THEORY [GPB-111]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1	**History of Genetics and Plant Breeding**	Definitions: Genetics, Plant Breeding, Domestication, Plant introduction; History/ Milestones/ Major Contributions in/of Genetics and Plant Breeding.	5
2	**Study of Chromosome**	Structure of chromosomes: Nucleosome-solenoid model. Types of chromosomes: Based on position of centromere, Autosomes and Sex chromosomes, Special chromosomes (in brief). Structural aberrations: (deletions, duplications, inversions and translocations); Polyploidy in plants: (Numerical aberrations: Autopolyploidy and Allopolyploidy). Definitions: Chromosome, Karyotype. Functions of chromosomes in inheritance.	10
3	**Cell Division**	Mitosis: Stages and Significance in growth and asexual reproduction; Meiosis: Stages and Significance in genetic diversity.	10
4	**Mendel's Laws of Inheritance**	Law of Segregation: Statement, Explanation and Example with pea plants. Law of Independent Assortment: Statement, Explanation and examples. Reasons for Mendel's Success, Exceptions to Mendelism; [Definitions: Gene, Allele, Dominant and Recessive alleles, Epistasis, Genotype, Phenotype, Monohybrid cross, Dihybrid cross, Back cross, Test cross].	5
5	**Modes of Reproduction**	Sexual and Asexual modes of reproduction; Definitions, Their significance in Plant Breeding	5
6	**Modes of Pollination**	Self-pollination: Definitions, Characteristics, Promoting Mechanisms and Examples. Cross-pollination: Definitions, Characteristics, Promoting Mechanisms and Examples. Often-cross pollination: Definitions and Examples. Pollinators in brief:(insects, animals, wind, water)	5

Continued…

7	**Self Incompatibility**	Definition, Mechanisms of self-incompatibility; Types of self-incompatibility/ SI Systems: (sporophytic, gametophytic) with Examples. Role / Use of SI in Plant Breeding.	10
8-9	**Male Sterility**	Definitions of male sterility systems in plants. Types of male sterility: (Cytoplasmic, genetic, CGMS and Environmental) Significance in Plant Breeding: Utilization/ Role of male sterility in developing hybrid crops and hybrid seed production.	10
10-11	**Breeding for Self-pollinated Crops**	Breeding Objectives for self-pollinated crops with examples. Definitions, Principles/Concept, Purpose, Method/Steps involved, Advantages, Applications of following breeding methods: Mass Selection: Pure Line Selection: Pedigree Method: Bulk Method:	10
12-13	**Breeding for Cross-pollinated Crops**	Breeding Objectives for cross-pollinated crops with examples. Definitions, Principles/Concept, Purpose, Method/Steps involved, Advantages, Applications of following breeding methods: Ear-to-Row Method: Backcross Method: Development of Synthetics: Development of Composites: Development of Hybrids:	10
14	**Breeding for Vegetatively Propagated Crops**	Breeding Objectives for vegetatively propagated crops. Clonal Selection: Definitions, Principles, Steps, and importance, Merits & Demerits. Examples of vegetative propagating crops; Role of clonal selection in crop improvement.	10
15-16	**Mutation**	Mutation (Definition); Introduction; Characteristics; Classification/Kinds/Types of Mutation. Mutagenic agents/Mutagen (Definition), Types of mutagens (Physical, Chemical- with e.g.), and Induction (method of mutagenesis). Role of Mutation in Plant Breeding.	10
		Total=	**100**

TEACHING SCHEDULE

PRACTICAL [GPB-111]

Exercise No.	Exercise Title
1	Study of Microscopy, Simple and Compound microscope
2	Monohybrid - Mendelian ratios and Problems solving.
3	Dihybrid - Mendelian ratios and Problems related to Segregation and Independent Assortment
4	Study of floral biology and structure of a model flower
5	Study of floral structure and biology of important cereals
6	Study of floral structure and biology of important pulses and oilseeds
7	Study of floral structure and biology of important commercial crops
8	Study of Plant Breeder's Kit
9	Selfing and Crossing techniques
10	Male sterility: A, B and R lines and their utility
11	Pollen fertility study and its importance
12	Study of germplasm of various major crops
13	Problems in hybrid seed production
14	Layout of field experiments
15	Principles, Data recording and Elementary statistics and Analysis of data
16	Visit to different crop breeding schemes/stations.

Suggested Readings [GPB-111]:

1. An Introduction to Genetic Analysis, Suzuki *et. al*.
2. Principles of Genetics, E.J. Gardner, M.J. Simmons, D.P. Snustad, Wiley India (P) Ltd.
3. Genetics, P.K. Gupta, Rastogi Publication, Meerut.
4. Fundamentals of Genetics, B.D. Singh, Kalyani Publication, New Delhi.
5. Genetics, M.W. Strickberger, Peerson Education, New Delhi.
6. Elements of Genetics, Phundan Singh, Kalyani Publication, New Delhi.
7. Genetics, Sushant Elrod and William Stansfield, McGraw Hill Publishing Company Limited, New Delhi.
8. Plant Breeding Principles and Methods, B.D. Singh, Kalyani Publication, New Delhi.
9. Essentials of Plant Breeding, Phundan Singh, Kalyani Publication New Delhi.
10. Principles and Practices Plant Breeding, J.R. Sharma, McGraw Hill Publishing Company Limited, New Delhi.
11. Plant Breeding Theory and Practices, V.L. Chopra, Oxford and IBH, Publishing Company, New Delhi.

Semester	**:**	**I**		
Course No.	**:**	**PATH-111**	**Credits Hrs. :**	**2(1+1)**
Course Title	**:**	**Management of Plant Diseases**		

SYLLABUS

Objectives:

(i) To understand the Biology, Epidemiology and Ecology of plant diseases,

(ii) To learn effective strategies for disease prevention, diagnosis and management in agricultural systems,

(iii) To explore Integrated Disease Management approaches, including cultural, chemical and biological control methods,

(iv) To develop skills to mitigate the impact of plant diseases on crop yield, quality and sustainability.

THEORY

Economic significance of post-harvest diseases and seed-borne diseases. Historical development in Seed Pathology and Post-harvest diseases. Objectives of Seed Pathology and Post-harvest diseases. Study of important Post-harvest Diseases (transport, storage and market) of perishables and grains etc. Important post-harvest diseases. Storage/Field fungi responsible for production of toxins and their effects on consumption. Mycotoxins and Aflatoxin. Identification and detection of plant pathogens carried through seeds, vegetatively propagating material. Seed processing, treatment and storage. Seed transmission, Seed contamination, accompanying pathogens, false seed transmission. Processing, seed treatment, seed packaging, packaging materials. Functional requirement to packing materials. Epidemiology, Factors affecting disease development, Assessment of disease severity and crop losses. Principles of plant disease management viz., Avoidance, Exclusion, Eradication, Protection, Immunization-HPR and Biological control. Pesticides, Classification of fungicides. Modes of application. Management of post-harvest diseases. Biotechnological approaches of diseases management. IPR and related issues. IDM concepts and importance. IDM module for important post-harvest diseases.

PRACTICAL

Study of post-harvest disease symptoms caused by fungi, bacteria, virus, nematodes etc. Methods of diagnosis of various post-harvest diseases. Methods of estimation of disease severity and losses; Seed health testing techniques. Methods of detection and identification of seed-borne pathogens; Isolation of biocontrol agents; Testing the efficacy of biocontrol agents by dual culture technique. Mass multiplication and methods of application of bioagents. Study of fungicides, bactericides, nematicides and their formulations. Study of pesticide compatibility and their safe-use. Study of plant protection equipments. Bioassay of fungicides; Seed treatment techniques for the control of seed-borne diseases; Biocontrol of post-harvest diseases. Study of seed packaging and storage techniques. Visit to vegetable and fruit markets, biopesticide/pesticide firms. Visit to processing warehouse and testing laboratories.

TEACHING SCHEDULE

THEORY [PATH-111]

Lecture No.	Topic with Sub-topics/ Key Points	Weightage (%)
1	Economic significance of post-harvest diseases and seed-borne diseases.	5
2	Historical developments in Seed Pathology and Post-harvest diseases.	5
3	Objectives of Seed Pathology and Post-harvest diseases.	5
4	Study of important Post-harvest Diseases (transport, storage & market) of vegetables, fruits, oil seeds etc.	5
5	Important post-harvest diseases. Storage/Field fungi responsible for production of toxins and their effects on consumption. Mycotoxins and Aflatoxin.	10
6	Identification and detection of plant pathogens carried through seeds, vegetatively propagating material. Seed processing, treatment and storage.	5
7	Seed transmission, Seed contamination, Accompanying pathogens, False seed transmission.	5
8	Processing, Seed treatment, Seed packaging, Packaging materials.	10
9	Functional requirement of packing materials.	5
10	Epidemiology, Factors affecting disease development, Assessment of disease severity and crop losses.	5
11	Principles of plant disease management viz., Avoidance, Exclusion, Eradication, Protection, Immunization- HPR and Biological control.	10
12	Pesticides. Classification of Fungicides.	5
13	Modes of application of Fungicides	5
14	Management of Post-harvest diseases	10
15	Biotechnological approaches of diseases management. IPR related Issues.	5
16	IDM concepts and importance. IDM module for important post-harvest diseases.	5
	Total=	**100**

TEACHING SCHEDULE

PRACTICAL [PATH-111]

Exercise No.	Exercise Title
1-2	Study of post-harvest disease symptoms caused by fungi, bacteria, virus, nematodes etc.
3	Methods of diagnosis of various post-harvest diseases.
4	Methods of estimation of disease severity and losses; Seed health testing techniques.
5	Methods of detection and identification of seed-borne pathogens.
6	Isolation of biocontrol agents; Testing the efficacy of biocontrol agents by dual culture technique.
7	Mass multiplication and methods of application of bioagents.
8	Study of fungicides, bactericides, nematicides and their formulations.
9	Study of pesticide compatibility and their safe-use.
10	Study of plant protection equipments.
11-12	Bioassay of fungicides; Seed treatment techniques for the control of seed-borne diseases.
13	Biocontrol of post-harvest diseases.
14	Study of seed packaging and storage techniques.
15-16	Visit to vegetable and fruit markets, biopesticide/ pesticide firms, processing warehouse and testing laboratories.

Suggested Readings [PATH-111]:

1. Pathak, V.N. Essentials of Plant Pathology. Prakash Publ., Jaipur
2. Agrios, G.N. 2010. Plant Pathology. Academic Press.
3. Kamat, M.N. Introductory Plant Pathology. Prakash Publ., Jaipur
4. Singh R.S. 2008. Plant Diseases. 8th Edn. Oxford & IBH. Publ. Co.
5. Singh R.S. 2013. Introduction to Principles of Plant Pathology. Oxford and IBH Publ. Co.
6. Alexopoulos, Mims and Blackwel. Introductory Mycology.
7. Mehrotra, R.S. and Aggarwal, A. 2007. Plant Pathology. 7th Edn. Tata McGraw Hill Publ. Co. Ltd.
8. Verma, J.P. 1998. The Bacteria. Malhotra Publ. House, New Delhi.
9. Goto, M. 1990. Fundamentals of Plant Bacteriology. Academic Press, New York.
10. Dhingra, O.D. and Sinclair, J.B. 1986. Basic Plant Pathology Methods. CRC Press, London, Tokyo.
11. Nene, Y.L. and Thapliyal, P.N. 1993. Fungicides in Plant Disease Control. 3rd Edn. Oxford and IBH, New Delhi.
12. Vyas, S.C. 1993. Handbook of Systemic Fungicides. Vols. I-III. Tata McGraw Hill, New Delhi.

#List/ Bouquet of Skill Enhancement Courses (SECs)

Sr. No.	Course No.	Course Title	Credit Hrs.
1.	**SEC-xxx**	Computer Applications in Agriculture	2(0+2)
2.	**SEC-xxx**	Production Technology for Bioagents and Biofertilizers	2(0+2)
3.	**SEC-xxx**	Seed Production and Seed Testing	2(0+2)
4.	**SEC-xxx**	Livestock Production and Management	2(0+2)
5.	**SEC-xxx**	Poultry Production Technology	2(0+2)
6.	**SEC-xxx**	Development of Agri-business Proposal	2(0+2)
.	**SEC-xxx**	*(To be added)*	2(0+2)
.	**SEC-xxx**	*(To be added)*	2(0+2)

Note: Skill Enhancement Courses can be added/ offered as per the facilities and resources available at the respective universities/colleges based on the relevance to the region and the UG degree subject.

In case of unavailability of said detailed course-wise syllabus of above or new SEC courses, the same can be primarily developed and followed at College/ University level in the academic year, 2024-25; However, the same will be obtained from the respective UG Degree Coordinator/ Discipline Coordinators and can be followed w.e.f. AY, 2025-26.

[Above list is an indicative list/bouquet of SEC courses and subject to modification as applicable therein]